CONTINUOUS ROOF TRUSS RESTRAINT

FIELD OF THE INVENTION

This invention relates to construction materials used in retaining roof trusses, and in particular to a continuous roof truss restraint to accommodate high wind loads.

BACKGROUND OF THE INVENTION

Property damage frequently occurs when a structure is exposed to wind gusts, down bursts, tornados, sustained high winds, or the like. Some areas of the country are prone to sustained high winds such as those produced from hurricanes. Wind damage may cause the loss of personal property and life should the roof of a structure be destroyed, exposing both the building interior and its contents to the elements.

Current building codes for hurricane prone areas include roof restraints, commonly referred to as tie-downs or hurricane straps. The tie-downs consist of thin metal straps extending in a vertical format to connect a wall support member directly to the truss support. In a similar construction technique, walls formed from concrete employ the use of tie-down straps with securement made in a vertical format between the concrete wall and the roof truss directly above the concrete wall, by use of nails or screw fasteners (Tapcons). Foam core

construction, capable of withstanding extremely high winds by use of a concrete coating, currently employ the same tie-down strap as used in other types of construction.

Tie-down straps typically require 6 to 8 fasteners in addition to those fasteners required to fasten the framing members together. The use of fasteners on the strap results in a load transfer directly from the roof truss to the vertical support below wherein loss of strength in the wall support can result in strap failure, as all of the strap fasteners may fail along the same alignment. For example, a tie-down strap may be two inches wide with the fasteners located along a parallel plane. Should a breach of the vertical support occur along the parallel plane, the holding strength of all the fasteners are compromised. Thus, if the single vertical support is weak, the tie-down strap is unable to distribute the loading horizontally and is not effective.

Further, tie-down straps are narrow strips of metal which do not prevent wind from passing between the straps. Thus, failure of a soffit may allow structural damage by allowing the environment to enter the structure. Once the wind is exposed to the interior of the structure, the uplift forces could be so great that the remaining tie-down straps can fail. Finally, current installation of tie-down straps is not consistent and the strength of which is partially dependent upon the skill of

the installator. A number of patents have been granted to address various aspects of tie-down strip problems.

U.S. Patent No. 5,390,460 discloses a roof securing system utilizing an elongated strap for reinforcing the attachment of underlying sheathing members to the truss structure of the roof.

U.S. Patent No. 5,722,212 discloses the use of retaining clips for roof tiles. This patent focuses on retention of the lower end of a shingle to prevent the shingle from lifting and being removed by heavy winds.

U.S. Patent No. 5,560,156 discloses a hurricane tie-down member formed from a planar saddle having a pair of side arm members and flat anchor surfaces. The saddle portion transfers upward forces to a vertical load bearing wall by the side arm members that terminate at their lower ends in flat anchor surfaces, which in turn are anchored to the vertical wall.

U.S. Patent No. 4,714,372 discloses a hurricane tie connector for wood frame construction which employs two plane tension connector bases upon a right angled triangular base member including a generally straight base edge and a generally straight truncated edge joined by an inside edge, a right angled triangular web member having a straight base edge and a truncated edge joined by an inside edge and joined to the base member along the inside edge.

Despite the of construction and the inherent securement of roof trusses to the wall frame members, the ability to secure a roof structure to a wall structure remains of unique concern. This area of construction remains susceptible to failure should high winds contact the cantilever overhang and either expose the interior of the structure or weaken the vertical support structure.

Thus, the prior art fails to provide a method or device which provides a tie-down strap that distributes loading along a horizontal plane and creates a wind barrier furthering a roof's ability to withstand uplift forces along both the exterior and interior walls.

SUMMARY OF THE INVENTION

The present invention is directed toward an apparatus and method of building construction which addresses the traditional framed wall and trussed roof construction and provides a construction technique that enhances storm and hurricane resistance. The apparatus is a structural member positionable between the vertical wall supports and the angled roof truss by use of a cap member placed along a horizontal plane to cover a plurality of vertical wall support members. An inner strap member is secured along a first side edge of the cap member and securable to the obtuse roof truss support along an opposite side edge. An outer strap member is secured along a second side edge and securable to the oblique roof truss support along an opposite side edge. The cap member and inner and outer strap creates a continuous tie down hurricane strap capable of preventing separation of the roof trusses from the vertical walls along the interior and exterior of the structure, and inhibit wind from entering between the straps. In effect, the apparatus provides a continuous restraint in a horizontal format. In an alternative embodiment, elements of the inner strap member, outer strap member, and cap member can be formed as a unitary structure wherein the inner strap member and outer strap member are integrally formed with the cap member.

The apparatus can be manufactured from a material selected

from the group consisting of aluminum, galvanized steel and plastic. The structural member provides an enhanced tensile load characteristics being effective to render the structure impervious to damage from winds in the range of about 155-310 mph.

Accordingly, it is an objective of the instant invention to teach a unique method of building construction utilizing a continuous tie-down strap capable of withstanding hurricane force winds.

It is a further objective of the invention is to teach a tie-down strap that provides a vertical wall header for use with panel interface construction capable of being made impervious to wind velocities in the range of about 155-310 mph.

Another objective of the invention is to teach a tie-down apparatus that can be used on wood, metal, or concrete framed construction and can be covered with exterior coatings as it can be used as part of the framing structure instead of individual straps.

Still another objective of the invention is to teach the use of a tie-down apparatus that can be preassembled with inner and outer straps coupled to a cap member, or assembled at site where the inner and outer straps are coupled to the cap member

after the cap member is secured.

Another objective of the invention to disclose a horizontal disposed tie-down connector that further operates as a header.

Other objectives and advantages of this invention will become apparent from the following description taken in conjunction with the accompanying drawings wherein are set forth, by way of illustration and example, certain embodiments of this invention. The drawings constitute a part of this specification and include exemplary embodiments of the present invention and illustrate various objects and features thereof.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is perspective view illustrating multiple roof trusses and vertical support members secured to together by the continuous tie-down apparatus of the instant invention;

Figure 2 is cross-sectional view illustrating the continuous tie-down apparatus;

Figure 3 is a side view of the tie-down apparatus illustrated in Figure 2,

Figure 4 is a side view of an alternative embodiment fo the tie-down apparatus of the instant invention;

Figure 5 is a perspective view of an alternative embodiment of the tie-down apparatus illustrated in Figure 4.

DETAILED DESCRIPTION OF THE INVENTION

With reference to Figure 1, a metal structure such as that found in a concrete foam structure patented by the instant inventor under U.S. Patent No. 6,185,891, the contents of which is incorporated herein by reference, employ rigid panels of environmentally sensitive rigid styrene foam placed within an underlying structure of wall members 10, 12 & 14 and roof members 16, 18 & 20. In such an embodiment, foam having a thickness of 8" is inserted between the wall and roof members during an assembly stage and multiple foam panels are adhesively engaged to each other at joints with a polyurethane adhesive or the like to form a rigid, adhesively engaged, sealed structure.

The tie-down apparatus of the instant invention can be formed into an integral part of the construction and consists of cap member 22 having a top surface 24 and downwardly depending side edges 26 and 28. The cap member 22 is placed over the upright wall members 10, 12 & 14 and secured thereto by rivet, screw, or the like fastener 30. It is reminded that this system can be applied to wood frame or cement block, or the like construction that current employ conventional tie-down straps. The cap member 22 maintains the wall members at a predetermined distance in the form of a header or tie beam allowing preassembly of walls.

The cap member 22 provides support for inner strap 32 having a sidewall 34 securable to sidewall member 26 by use of a fastener 30 previously described. The inner strap 32 includes an angled top portion 36 securable to the truss member 16, 18, and 20, the angled top portion 36 meeting the truss members at an obtuse angle. In this embodiment, the metal formed truss member 16 is formed into an I-beam shape by use of two C-shaped channels secured back to back. The truss member 16 is fastened 38 along the obtuse angle 36 formed between the supports by the previously mentioned fastening means 30. Similarly an outer strap 40 includes an angle 42 securable to the I-beam as depicted by numeral 44 on truss member 16 at the oblique angle presented. The outer strap 40 includes a downwardly depending member 46 for fastening directly to cap member 22 by the previously mentioned fastening means 30.

The assembly provides a cap member that prevents movement of the vertical supports 10,12, and 14 and by use of the inner and outer straps provide for a distribution of stress along a horizontal plane for the truss members 16, 18, and 20. The assembly further operates as a continuous strap for wind abatement by preventing air that may enter the soffit from passing between the truss members along the vertical supports, which would otherwise result in an upward lift to the roof. The inner strap 40 provides additional strength to the roof which

is not available with the single strap design. In addition, the use of a continuous strap along the interior wall prevents air from entering the backside of the assembly should structural damage occur to windows, wherein the inner portion of the structure otherwise exposed to high winds.

Referring to Figures 2 and 3, set forth is a perspective and side view of a single vertical beam 10, formed from C-channels 52 and 54, the beam 10 is secured to a foundation header 56 or directly to a foundation 56. The securement may include a lower tie-down strap 60 of conventional design. The cap member 22 is depicted with depending member 26 wherein sidewall 34 of inner strap 32 is attached thereto. The inner strap having an upper portion 36 formed along an obtuse angle that meets the pitch of the roof truss 16. Similarly outer strap 40 includes an outer angle portion 42 formed from an oblique angle that is also fastened to the truss member 16 with fasteners.

In an alternative embodiment, elements of the inner strap member, outer strap member, and cap member can be formed as a unitary structure. Figures 4 and 5 respectively illustrate a side and perspective view of an embodiment of the present invention in which the inner and outer straps are formed integral to the cap member, thus forming the roof restraint 62. The roof restraint 62 is a unitary structure which includes an

inner strap portion 75 and an outer strap portion 81 which are integrally formed with a horizontal cap portion 71. The roof restraint 62 is a continuous structure, similar to that shown in Fig. 1, which positionable over multiple vertical wall supports to create a continuous hurricane strap. The horizontal cap portion 71 has a first edge 85 and a second edge 86 having a distance therebetween sufficient to span the width of the beam 10. The outer strap portion 81 is contiguous to horizontal cap portion 71 and depends downwardly from the second edge 86 at an angle equal to the pitch of the roof truss 16. The inner strap portion 75 is contiguous to the first edge 85 of the cap portion 71. The inner strap portion 75 has a first and second contiguous planar sections 87 and 88 meeting at a line of intersection 91. The first section 87 extends perpendicularly upward from the cap member and the second section 88 extends outwardly at an angle from the line of intersection 91 so as to be in alignment with the pitch of the roof truss 16. The inner strap portion 75 and outer strap portion 81 fastened to truss member 16 by fasteners 78 and 74. As best seen in the perspective view shown in Figure 5, the cap portion 71 is fastened by fasteners 64 to the I-beam 10.

It is to be understood that while a certain form of the invention is illustrated, it is not to be limited to the specific form or arrangement of parts herein described and

shown. It will be apparent to those skilled in the art that various changes may be made without departing from the scope of the invention and the invention is not to be considered limited to what is shown and described in the specification and drawings.